

# SCSI

This chapter presents the PC 99 requirements and recommendations for the small computer system interface (SCSI). The use of SCSI in a PC 99 system is optional, but if SCSI is used, all components must comply with the requirements defined in this chapter.

SCSI is a flexible I/O bus that is used in the design of a wide variety of peripherals, including disk drives, CD-ROM drives, tape drives, scanners, and magneto-optical drives. The SCSI host adapter is the circuitry that serves as an interface between the system and one or more SCSI peripherals. A host adapter can be a card that plugs into the system's expansion bus, such as a PCI card, or it can be designed directly into the system board.

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## SCSI Host Adapter Requirements

This section summarizes class specifications and standards for SCSI host adapters.

### 1. Host controller supports bus mastering

*Required*

The host controller must support PCI bus mastering and PCI bus mastering must be enabled by default.

### 2. Bootable SCSI controller supports El Torito No Emulation mode

*Required*

A bootable SCSI storage controller must support the No Emulation mode defined in *El Torito—Bootable CD-ROM Format Specification, Version 1.0*, by IBM and Phoenix, or an equivalent method that supports the Windows NT CD-ROM installation process.

### 3. Option ROMs support Int 13h Extensions

*Required*

The Int 13h Extensions ensure correct support for high-capacity drives, consistent drive-letter mapping between real and protected modes, and other capabilities for both Windows and Windows NT. Support for the fixed-disk access subset of Int 13h Extensions must be provided in the system BIOS and in any option ROMs for storage devices that include BIOS support. The Int 13h Extensions are defined in the Windows NT 5.0 DDK and in the “Layered Block Device Drivers” section of the Windows 98 DDK.

### 4. Option ROMs support virtual DMA services

*Required*

Plug and Play SCSI host adapters must support virtual DMA services in the host-adapter option ROM and must support bus mastering. Virtual DMA supports scatter/gather capabilities, solving the problem of mapping linear addresses (segment:offset) into physical addresses.

### 5. Bus type is clearly indicated on connectors for all adapters, peripherals, cables, and terminators

*Required*

Connectors for each SCSI adapter, peripheral, cable, and terminator must be clearly labeled to indicate the bus type. All external SCSI connectors must display the appropriate SCSI icon defined in *Small Computer Interface Parallel Interface* (SPI) standard, Annex F, and must display any clarifying abbreviations or acronyms. The following are applicable acronyms and their definitions:

- **DIFF** – differential. A signal type used in external large storage cabinets.
- **SGL** – single-ended. The most commonly used signal type, such as found in home PCs and high-end workstations.

- **LVD** – low voltage differential. Signal type of same strength as DIFF with regard to cable length.

#### **6. Differential devices support DIFFSENS as defined in SCSI-3SPI standard**

*Required*

Without DIFFSENS, the differential bus drivers and/or a single-ended device may be damaged if a single-ended device is connected to a differential bus.

The specification for DIFFSENS is defined in Section 5.4.2 of the SCSI-3SPI standard.

#### **7. Automatic termination circuit and SCSI terminators meet SCSI-3 specification**

*Required*

SCSI add-on adapters and on-board controllers must use automatic termination, which allows a user to add external devices without removing the PC case. Terminators used in the SCSI host adapter must be regulated terminators, also known as active, SCSI-3 SPI, SCSI-2 alternative-2, or Boulay terminators. SCSI termination built onto internal cables meets SCSI-3 specification.

#### **8. Terminator power is supplied to the SCSI bus with over-current protection**

*Required*

There are two separate requirements. The base requirement is that for system-board implementations using PCI or another expansion bus, the host adapter must supply terminator power (TERMPWR) to the SCSI bus. All terminators on the host adapter, as well as those on the internal and external SCSI bus, must be powered from the TERMPWR lines on the SCSI bus.

The additional requirement is that the circuit that supplies TERMPWR must have overcurrent protection built into it. That is, devices that provide TERMPWR must also provide some means of limiting the current, through use of a self-resetting device. For example, a positive-temperature coefficient device or circuit breaker can be designed into the circuit. These devices open during an over-current condition and close after the condition ends.

Although recommended, this item is not required for battery-powered systems that implement the SCSI host adapter as a PC Card device, because of battery consumption issues.

#### **9. External connector meets SCSI-2 or later standard**

*Required*

Although an external connector is optional, if an external connector is provided, it must be a high-density connector and must meet the requirements defined in the SCSI-2 or later standard.

**10. SCSI bus parity signal meets SCSI-2 standard***Required*

The SCSI host adapter must implement the SCSI bus parity signal defined in the SCSI-2 standard, and parity checking must be enabled by default.

## SCSI Peripheral Requirements

This section summarizes requirements related to specifications and standards for SCSI peripherals.

**11. SCSI bus parity signal meets SCSI-2 standard***Required*

All SCSI peripherals must implement the SCSI bus parity signal defined in the SCSI-2 standard, and parity must be enabled by default.

**12. User cannot incorrectly plug in cables***Required*

For an internal and external configurations, the internal SCSI bus cable must be plugged into shrouded and keyed connectors on the host adapter and devices. This ensures that the cable is properly positioned. For internal configurations, pin 1 orientation must be designated on one edge of the ribbon cable and also on the keyed connector of the SCSI peripheral device.

**13. External devices use automatic termination or an accessible on-board termination switch***Required*

The recommended implementation for an external SCSI peripheral device is to provide automatic termination. In the absence of automatic termination, a mechanical means must be provided for setting termination, and the switch must be accessible to the user without opening the device chassis.

**14. Shielded device connector meets SCSI-2 or later standard***Required*

Device connectors must meet the specifications defined in the SCSI-2 or later standard.

**15. Removable media includes media status notification support***Recommended*

SCSI devices should support media status notification as defined in MMC-2.

A specification has not yet been completed for implementing media event status notification. However, the projected specification will be similar to the Media Event Status Notification subsection of SFF 8090 (Mt. Fuji specification). This specification is available at <ftp://fission.dt.wdc.com/pub/standards/SFF/specs/>.

~~When a completed specification is available, support for media status notification will become a requirement.~~

## Plug and Play for SCSI Host Adapters and Peripherals

This section summarizes the Plug and Play requirements for SCSI devices.

### 16. Each host adapter has a Plug and Play device ID

*Required*

For a system-board device, there must be a Plug and Play device-specific ID.

Each SCSI controller or peripheral device must provide device IDs as defined in the *Plug and Play SCSI Specification, Version 1.0*, and in the specification for the bus it uses as defined in the related chapter in Part 3 of this guide. For example, a PCI device must comply with PCI 2.1 and also must provide a Subsystem ID and Subsystem Vendor ID as defined in the “PCI” chapter in Part 3 of this guide.

PCI controllers integrated into core logic on the system board do not have to provide Subsystem IDs and Subsystem Vendor IDs, but must meet other PCI 2.1 requirements.

### 17. Automatic resource assignment and dynamic disable capabilities supported for all host adapters and controllers

*Required*

For SCSI on-board controllers and add-on adapters, the system must be capable as necessary of automatically assigning, disabling, and relocating the resources used by the adapter. Configuring the adapter or adding it to the system must not require changing jumpers or switches on either the adapter or the system board. In the event of an irreconcilable conflict with other devices, the operating system must be able to disable the adapter.

### 18. SCSI controllers provide multi-initiator support

*Recommended*

Multi-initiator support allows two SCSI controllers—each installed in a separate computer system—to coexist on a shared SCSI bus with a set of shared devices. If this capability is supported, the SCSI IDs must be changeable from the default SCSI controller ID of 7, and the boot-time SCSI bus reset operation must be able to be disabled on each controller attached to a shared bus.

This capability is recommended for hardware that will be used on systems using the clustering service available under Microsoft Windows NT Server Enterprise Edition. To use this service, a SCSI adapter and a SCSI peripheral must provide multi-initiator support for at least two initiators.

**19. SCAM support is disabled by default***Required*

SCAM support is not recommended. If support is present, it must be disabled by default. SCAM is not supported by the Windows operating systems; enabling SCAM can cause the system to become unstable or inoperable.

## Power Management for SCSI Devices

This section summarizes the specific power management requirements for the SCSI bus class. Power management requirements for other device classes are defined in Part 4 of this guide.

**20. Bus and device meet PC 99 power requirements***Required*

Additional power management requirements are specified based on industry standards for the bus used by the controller and for the device. For more information, see the related chapter for the specific bus class in Part 3 of this guide. See also Part 4 of this guide for the related device class requirements based on compliance with the specific device class power management reference specification.

Although not required, it is recommended that hard disk drives spin-up and be able to complete a Read operation within 6 seconds of applying power and within 5 seconds of a START UNIT command. This is not expected to become a requirement.

**21. Hardware supports the STOP/START UNIT command as defined in the SCSI-2 standard***Required*

The SCSI peripherals must be able to fully recover from a software-initiated spin down without rebooting the system or cycling power. To properly support power management on SCSI drives and to ensure that the operating system responds to appropriate driver calls, the STOP/START UNIT command must be implemented as defined in the SCSI-2-3 standard.

**22. STOP/START UNIT command can be used to decrease power consumption***Required*

Wherever appropriate—for example, for storage disks—the STOP UNIT command can be used to decrease the power consumption of the base platform. The device must be capable of supporting many tens of thousands of START/STOP UNIT commands over the life of the device.

## SCSI References

The following represents some of the references, services, and tools available to help build hardware that is optimized to work with Windows operating systems.

Device class power management reference specifications

<http://www.microsoft.com/hwdev/onnow.htm>

*El Torito—Bootable CD-ROM Format Specification, Version 1.0*

*Compaq, Intel, Phoenix BIOS Boot Specification, Version 1.01*

<http://www.ptltd.com/techs/specs.html>

*MMC-2 Multi-Media Command Set-2*

<ftp://ftp.symbios.com/pub/standards/io/t10/drafts/mmc2/mmc2r05.pdf>

*PCI Local Bus Specification, Revision 2.1 (PCI 2.1)*

PCI SIG

Phone: (800) 433-5177

<http://www.pcisig.com>

*Plug and Play SCSI Specification, Version 1.0*

<http://www.microsoft.com/hwdev/specs/>

*Small Computer Interface (SCSI-2) [X3T9.2-375R] specification*

*Small Computer Interface (SCSI-3) Parallel Interface (SPI)*

*[X3T9.2/91-10] specification*

SFF Committee publications

FaxAccess: (408) 741-1600 (fax-back)

Fax: (408) 867-2115

Global Engineering Documents

Phone: (800) 854-7179 (US)

(613) 237-4250 (Canada)

(303) 792-2181 (Outside North America)

Fax: (303) 397-2740

SCSI draft standards and other working documents are available at

<ftp://ftp.symbios.com/pub/standards/io/t10/>

Windows and Windows NT DDK

MSDN Professional membership

## Checklist for SCSI

If a recommended feature is implemented, it must meet the PC 98 requirements for that feature as defined in this document.

1. Host controller supports bus mastering  
*Required*
2. Bootable SCSI controller supports El Torito No Emulation mode  
*Required*
3. Option ROMs support Int 13h Extensions  
*Required*
4. Option ROMs support virtual DMA services  
*Required*
5. Bus type is clearly indicated on connectors for all adapters, peripherals, cables, and terminators  
*Required*
6. Differential devices support DIFFSENS as defined in SPI standard  
*Required*
7. Automatic termination circuit and SCSI terminators meet SCSI-3 specification  
*Required*
8. Terminator power is supplied to the SCSI bus with over-current protection  
*Required*
9. External connector meets SCSI-2 or later standard  
*Required*
10. SCSI bus parity signal meets SCSI-2 standard  
*Required*
11. SCSI bus parity signal meets SCSI-2 standard  
*Required*
12. User cannot incorrectly plug in cables  
*Required*
13. External devices use automatic termination or an accessible on-board termination switch  
*Required*
14. Shielded device connector meets SCSI-2 or later standard  
*Required*
15. Removable media includes media status notification support  
*Recommended*
16. Each host adapter has a Plug and Play device ID  
*Required*
17. Automatic resource assignment and dynamic disable capabilities supported for all host adapters and controllers  
*Required*
18. SCSI controllers provide multi-initiator support  
*Recommended*
19. SCAM support is disabled by default  
*Required*



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20. Bus and device meet PC 99 power requirements

*Required*

21. Hardware supports the STOP/START UNIT command as defined in the SCSI-2 standard

*Required*

22. STOP/START UNIT command can be used to decrease power consumption

*Required*

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